

A STUDY OF THE COURTING HABITS OF
MYRMARACHNE PLATALEOIDES (CAMBR.)—
A SPIDER MIMIC OF THE INDIAN RED-ANT
OECOPHYLLA SMARAGDINA.

BY

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The familiar red ant is mimicked by a few insects and spiders. Two spider mimics are fairly common and well known to naturalists in this country—the attid mimic, *Myrmarachne plataleoides* and the thomisid mimic *Amyciaea forticeps*. The habits of these spiders were studied by me, and in the course of my studies I made interesting observations on their mating habits. Comparison of these mating habits with the ordinary behaviour of these spiders in the field under different conditions, was found to be instructive. In this article the mating habits of *M. plataleoides* as observed in the field and in artificial cages, are described.

This spider moves about on plants infested by the red ants amongst which it would easily be overlooked. Though when it moves about ordinarily it is truly *Oecophylla*—like, while disturbed it betrays its arachnid and attid characters and to one who would patiently observe, the distinction becomes fairly easy.

One evening while out searching for these spiders during the Christmas holidays 1928, at Mavalikara, Central Travancore, I came across a nest outside which there was a full-grown male. It was observed for nearly half an hour: but I could not understand what it was about. Except for an occasional show of restlessness it remained patiently and calmly outside the nest. Evidently something inside was engaging its attention. As I did not want to wait longer, I thought of securing the specimen. Getting closer I was just attempting to drive it into an open tube, when, to my surprise, a female ran out of the nest and began 'staring' at me. Quite probably they were courting. Both the specimens were soon secured in tubes.

At home the specimens were placed in a large glass cage and watched closely. They wandered about the cage erratically for some time during which they met each other a number of times. At first they were too frightened to take notice of each other but later on there were signs of 'recognition'. They would pause and look at each other for a while, the male showing some signs of excitement. As the male however approached the female, the latter would run away. But after a little while they stopped and faced each other. The male raised its body on its legs and inclined the

falces downwards giving the body an arched form. In this attitude it approached the female in a series of short sudden jerks. As it drew nearer, the excitement increased and its movements became more jerky, turning now to the right and then to the left. Thus it 'displayed' itself before the female with bowed falces arched and uplifted body and with the first pair of legs lifted up; moving in sharp sudden jerks sideways and forwards. All the while the female was closely watching the 'antics' of the male, often turning in such a way as to keep it in full view. Both were in a state of great excitement. The male advanced slowly towards the female in this queer jerky manner till their front legs just touched. A few rapid mutual strokes by the palpi followed and with this the short 'dance' ceased. The arched body of the male resumed its normal position and all excitement seemed ended. The female remained quiet, slightly raising the abdomen and twisting it slightly to one side. The male moved forwards, got astride the female on one side, and felt with its palpus for the epigynum. The palpus on that side nearest to the female's abdomen was applied to the epigynum and for about five minutes they remained in this position. The male then moved backwards and then again moving forwards got astride the female on the other side and the other palpus was applied to the epigynum. The copulation over, the male moved away, while the female remained quiet for a little time.

Similar modes of courtship and pairing have been observed a number of times in my cages where mature males and females were kept together. But a few other observations which I have made on these spiders and their allies in the field have convinced me that this is not the normal way in which pairing takes place under natural conditions but that this occurs only under artificial conditions.

On several occasions I have taken males and females from the same nests and their behaviour and the readiness with which they paired when put together make one feel certain that they must have been pairing or preparing for pairing within the nests.

On one occasion I observed a male and a female of this spider moving about on the same leaf. As it was very inconvenient to watch them there I secured them and placed them in a cage. They ran about for sometime and eventually faced each other. The male soon began to pay attention to the female. It approached the latter in the usual jerky excited manner turning to one side and then to the other in regular alternation; but the female would turn round and run away. The male however persisted in paying his attentions and at last the female stopped, turned round, and faced the male. They touched each other by their forelegs and then the female stroked the falces of the male by her palpi. Some mutual recognition must have passed between them! For, this time, unlike the previous instances, no attempt was made at immediate pairing but after an 'agreement' as it were, the female hurried off to a corner of the cage and began busily to make a nest. The male showed no anxiety to pursue her. It watched the female closely, and leisurely moved towards her. When he neared, the female left off her work, came out and stroked the male with her palpi for a second and immediately hastened away to her work. The male

quietly continued waiting outside. The female worked very fast and soon got a nest ready. The next day the male was found to get in and pair.

Similar observations I have made in a mimic of the small red ant *Solenopsis* and also in certain dark mimics.

During the summer of 1930 and again in 1931 I had further opportunities to observe the courting habits of these spiders at Parur in North Travancore. While these observations generally confirmed the view given above that pairing takes place within the nest, certain other interesting details were noted.

On the 4th June 1930 I came across a nest in which were a male and a female. Closer scrutiny showed that they were not in the same chamber but were in two separate compartments of the same nest. There was a well-built nest in which the female was. This nest was completely covered over by a larger silken dome, rather sparsely woven, and within this was the male. From this chamber he had free access to the female's compartment. They remained each in its respective compartment quietly for four days. On the morning of the 8th I was surprised to note that the female had moulted and that its cast off skin was lying on a side in the nest. It was very surprising for it meant that the spider was, till then, only in the penultimate stage and was not a mature female. After some time the male who appeared to have been watching all these events showed restlessness, got out of its retreat and began to wander about the leaf for some time. Then it returned to the female's nest, was admitted into it, the female meeting it at the entrance and showing the usual expressions of excitement and then they paired inside the nest.

On the 8th June 1930 two of these spiders, a male and a female were seen on the underside of a plantain leaf. The female was very busy weaving a nest while the male was quietly observing from the outside, occasionally fastening a few strands overhead making the outer nest. In a short time the nest was completed and the female took her position in the inner and well constructed nest. The male waited outside for a long time. Then it was noticed to wander away returning in about an hour. It waited outside and made no attempt to get into the female's nest. Till the 12th June I observed them in the same position. On the 12th morning the female had moulted; the male was still waiting outside. These were not further observed but there is no doubt that soon the male must have got into the female's nest and paired.

Again at Parur, on the 8th May 1931, a female was observed in the hollow of a leaf within a nest of closely woven silk. Outside this and enclosing it, was a larger nest which was not however so carefully constructed as the inner one but consisted merely of a large number of silk strands. In this outer enclosure, was a male. They remained quietly till the 10th when the female was found moulted. The male came out of the retreat, moved about the leaf for a while and then returning to the female's nest entered the nest and paired.

On the 17th December 1931 I again observed a female in a fully formed nest with a male watching outside. The next morning

the female had moulted and by noon they were observed to pair inside the nest.

A few double nest of the same pattern as described above were observed at Mavalikara, Central Travancore, on the 16th September 1932. One of these was kept under observation. On the 19th night the female moulted and on the 20th I noticed them pairing within the nest.

Since making these observations, I have, almost every time I was out in the field searching for these spiders, come across one or more of these double nests or mating nests each having a female in the penultimate stage in the inner chamber and an adult male in the larger outer chamber. A number of times I have taken these females to examine if they are in the penultimate stage. On a few occasions they were found to be adults; but in all these cases the moulted skin lying inside the nest bore unmistakable testimony to the fact that its moulting to the adult was quite recent and took place only after she retreated into the mating nest. In the few previous instances of pairing which I observed and have recorded above, it is likely that the cast off skins in the nests were overlooked since such a phenomenon was not suspected at all.

In August 1933 I made very similar observations on the courting habits of two black mimics—*M. manducator* and another species not yet identified—from Cape Comorin and Vattakottai near the Cape. A number of mating nests with the females in the penultimate stage guarded by adult males were seen. Similar mating nests were also observed at Courtallam beyond the Ghauts, in August 1934.

In January 1932 the following observation was made. A male in the course of his wanderings came across a female still within its nest. This female was in the final stage. The male approached the nest with some jerks but without the details of courting which were observed when it took place in the open, and introduced both its first pair of legs into the female's nest. She was agitated, showed a few jerky movements and embraced the front legs a number of times. The male withdrew for a moment and then immediately returning, thrust the front legs as before into the nest. The female stroked the front legs with her palpi and front legs. This was repeated two or three times and then the male entered the nest and paired with the female.

In July 1934 the following experiments were made on *M. platyleoides* in cages. On the 14th of July I secured a mature male and also a female in the penultimate stage: these were put in separate cages for a day. At night they made their usual silken chambers and retreated into them.

The next morning I introduced into the cage in which the mature male was, a female in the penultimate stage. The female wandered about the cage and came across the male in his retreat. She moved towards the entrance of this retreat and introduced her forelegs and anterior region of her body into it. The male met her and a few rapid jerky strokes of the palpi and contacts of front legs followed. The male then hurriedly got out of the nest

and the female directly got into it. She immediately began to make the walls of the nest thicker. The male waited outside for a few minutes and then wandered away for a while. However, it soon returned and took up its position outside the retreat and spun a few silken strands over his body and enclosing the female in her retreat. The next morning the female had moulted and a little later I saw the male getting into the nest and pairing. As he got into the nest the female met him at the entrance and the usual strokes of the palpi took place.

In the other cage where a female in the penultimate stage was kept and which had made a retreat of its own, I introduced a mature male. He wandered about the cage a little and then came across the nest of the female. Without any delay he thrust the first pair of legs and his elongated chelicerae into it. The female who was resting within with the head turned in the opposite direction, immediately turned towards the male and they felt each other by their front legs and palpi. This was accompanied by a few jerky movements of the body. The male then retreated from the nest and waited outside while the female remained quietly within the nest. The next morning she had moulted and a little later the male got in and they paired within the nest.

Again, I kept a mature female in a cage. She made a retreat and rested within. The next day while the female was still in her retreat, I introduced a mature male into the cage. He wandered inside the cage a little and then came across the female's retreat. As in the previous experiment, here also the male directly introduced himself into the nest, his forelegs and palpi thrust out in front. The apparently 'surprised' female felt the intruder with her palpi and front legs which immediately enabled them to recognise each other. After a little more of touches of legs and palpi, the male got into the nest and they paired inside the nest.

These observations show that the male in the course of his wanderings, *if he comes across a female which is only in its penultimate stage and is in her moulting chamber, takes charge of her and waits outside her nest patiently for her final moult to take place: that he, while thus waiting outside makes a large and loosely-woven nest outside the female's chamber and enclosing it. In this outer nest he remains. When the female has moulted and thus attained 'maturity' he gets into the inner nest without any special courtship and they pair within the nest. If however, he comes across a mature female within her nest, he directly introduces himself into the nest and pairs with her inside the nest.*

Several spiders are known to pair within 'pairing nests'.¹ But the antlike spiders of the family Attidae are supposed to pair outside any nests.² My observations of several species of *Myrmarachne* however convince me that in this genus at any rate pairing does not take place in the open but only inside nests though in

¹ T. H. Montgomery, 1910. *The American Naturalist*, vol. xlv.

² G. W. and E. C. Peckhams, 1889. *Occ. Pap. of the Nat. Hist. Soc. of Wisconsin* 2.

a state of confinement they may be noted to pair in the open. The necessity for retreating under the shelter of the silken canopy for pairing will be obvious when we remember that they live in the company of the ferocious red ants and that if pairing takes place in the open they run the risk of being surprised by the forager ants from the ant colony.

The observation that the males take charge of young females in the penultimate stage and wait till the latter moult, is not, however, without parallel though, as far as I could ascertain, no such observation has been recorded of any Indian spiders or, of any ant-mimicking spiders. However, one can be sure that if only the habits of spiders are sufficiently observed, many such instances would be forthcoming from the abundant spider-fauna of this land.

A number of American Attidæ have been observed where the male seizes an immature female and lives with her in mating nests till she moults and becomes mature.¹ Peckham has shown such a behaviour in *Philaeus militaris*.² McCook has given certain additional instances³ and Montgomery has described similar habits in *Phidippus purpuratus*.¹ They have also described members of other families such as Drassidae, Therididae and Lycosidae behaving in a similar manner. The commonly observed instances of the males of many orb-weaving spiders waiting near the webs of immature females must also be parallel phenomena to these. In a British clubionid, *Clubiona trivialis* the male is known to construct a nest near the nest of the female and tap upon the partition between them sometimes for days together.

Mating seems to be promiscuous; a male in the course of its wanderings may come across a female in the penultimate stage, in which case he waits outside for her to moult and then pairs with her. Or, if he comes across a mature female in her nest he gets in and pairs with her. The male may mate with a number of females successively and in the same way a female, after being impregnated by a male, may receive other males into her nest and pair with them successively.

From the above-recorded observations we may draw the following conclusions:—

1. When a mature male and a mature female are placed together in a cage the male 'courts' the female with characteristic jerky movements, uplifted front legs and bent abdomen and finally pairs with her in the open.

2. Under natural conditions however, such cases of courtship have not been observed. On the other hand males have been many times observed to come across females in their nests. The male without any formality introduces himself into the nest at the entrance of which the female meets him and there follows a few

¹ T. H. Montgomery, 1910. *The American Naturalist*, vol. xlv.

² G. W. and E. G. Peckhams, 1889. *Occ. Pap. of the Nat. Hist. Soc. of Wisconsin* 1.

³ McCook, 1890. *American spiders and their spinning work*, vol. ii.

'passes' of the front legs and palpi during which they appear to 'recognise' each other. If the female is an adult he gets in forthwith and mates with her. If she is only in her penultimate stage, he withdraws from the nest, and remains outside making a larger nest enclosing the female's nest and waits within it till she moults. After this event he gets in and pairs with her. If the female spider is not yet in the penultimate stage, she hastens away and escapes from the nest on feeling a male pushing himself into her nest.

3. The male is able to distinguish between a mature female and a female in the penultimate stage whom he had come into contact with and adapt his behaviour accordingly. At the same time the immature female—it is only natural that the mature females should recognise the male—which is only in its penultimate stage appears to have already attained to the 'adolescent instinct' which enables her to recognise and prepares her to receive the male.

'THE DANCE'.

The movements made by the male during courtship in the open, which, had not the later observations been made, would, certainly have been designated the 'courtship dance' deserves a little closer study. I have studied the behaviour of these spiders when they come across a stranger or a rival—the spider stops suddenly, looks closely at the stranger, the body is raised high on the legs, the palces are sloped downwards, and the first pair of legs are lifted upwards. A short pause in this attitude, and then he slowly approaches the other in short jerky movements or cautious measured steps. On approaching he seems to get clearer impressions about the other, for, his behaviour is modified according to it. If it is a large and formidable enemy it has faced, it suddenly darts back and escapes. If it is a rival male they both take up a fighting attitude. If it is a female he continues his jerky approach till their forelegs touch each other which appears to convey to each other the information they want. Quite possibly then, these 'courtship movements' and their behaviour when they come across any stranger are more or less similar in their earlier phases—only later as the movements proceed and the spiders get more definite impressions of the objects engaging their attention, they take different aspects.

Some insight into this phenomenon can be got by an investigation of what are called Abnormal courtship dances of several male spiders.

Peckham has recorded a male *Phidippus mccoookii* 'court' a female *P. clarus* while Locket saw a male *Tarentula barbipes* 'performing' in front of a male *Trochosa ruricola*. Berland noticed a male *Saitis barbipes* 'courting' in the absence of a female! Thus there are several recorded instances of male spiders beginning their 'courtship actions' before other males, mature or immature, of

their own species or even of another species.¹ My own observations on *Myrmarachne plataleoides* have shown that the preliminary parts of the 'courtship movements' were exhibited by the male in the presence of other males or other spiders even if separated from it by glass partitions. Nay, they have even on a few occasions been noticed to begin these movements before their own images in a mirror!

On one occasion when I casually turned towards one of my glass cages in which a mature male was kept, I saw him suddenly turn to a side and begin his 'courtship' movements. Of course, he did not continue it far but it was interesting that similar movements to 'courtship' were noted when apparently there was none nearby to cause any excitement. Probably Berland's observation of male jumping spiders courting 'nothing' is closely similar to this. He attributes this to Physiological excitement. It may be so; but while investigating this a simpler explanation that occurred to me is that the spider was not really courting 'nothing' as at first it appeared to be; but my movements in front of the glass cage either directly or by reflections on the sides of the cage gave the spider an idea of some stranger moving close by. It immediately put on its attitude of scrutiny and caution.

These 'abnormal courting phenomena' tell us that—

1. The male may begin the 'courtship movement' before other males, other spiders or even their own images.

2. The male does not need to 'recognise' the female by sight or by smell before he begins 'courting'. In fact the stimulus that initiates the movements of the male appears to be only something vague rather than anything definite.

3. When under these conditions 'courtship' has begun it does not however proceed to its culmination. As the male gradually approaches the object of his attentions he must certainly be getting some more definite impressions about the latter. If it is a male of another species its behaviour would be quite different; they may quietly resume their ways or the stronger would chase away the other. If it is an individual in a separate glass cage that has engaged the spider's attentions, it would soon find it physically impossible to get closer and failing to get the proper stimuli he would stop his attentions. On the other hand if it is a female whose presence has initiated these movements, as they approach they get more definite impressions of each other either by sight or smell and this would stimulate them further till their front legs touch each other. This is the climax of their effort to recognise each other; the cautious, 'on guard' attitude is given up and they prepare to pair.

CONCLUSION.

Our study of the courting habits of *M. plataleoides* has shown—

1. That 'courtship antics' do not take place usually in the natural

¹ T. H. Savory, 1928. The Biology of spiders.

state where the male merely gets into the nest occupied by the female and pairs with her within the nest.

2. When a certain form of 'courtship' appears to take place under certain conditions, *the spiders do not seem to recognise each other fully—there being only a general impression of a stranger at first.*

3. The earlier phases of those movements which constitute this 'courtship' are similar to those made by the male when he comes across any stranger. In the open under confinement, these movements proceed and if the object engaging his attentions chances to be a female of the same species, the necessary impressions are sooner or later received which stimulate the sex instinct in both and they approach one another and prepare to pair.

These would partly appear to support the views of Professor Montgomery¹ in his interpretation of the courtship phenomena among spiders. He remarks that the adult male is excited by sexual desire and at the same time by fear during courtship and that the movements of the male at this time 'are for the most part *exaggerations of ordinary motions of fear and timidity*'.

Here the male, however is bigger and he need not fear his mate in any way: yet his movements are suggestive of extreme caution. When however he comes across a female in her nest—as happens under natural conditions—he does not wait for any of his 'display' but merely gets into the nest through one of its opening. At the opening of the nest they meet and 'recognise' each other. *The cautious movements which are exhibited when they meet outside any nest are to be looked upon as the spider's peculiar way of 'on guard' approach towards a stranger for the purpose of 'finding out' its real nature, his eyes at a distance having given him only a vague impression.* When a male and a female confined in a cage have once met they thereafter meet and embrace a number of times without any repetition of the special movements.

Against this view it has been pointed out that the courtship antics are not exactly the ordinary movements of excitement, self-defence and caution. It may be so in many spiders but in *M. plataleoides* which has been the subject of this study there is practically very little difference. Montgomery, however, analysing the instincts at work in the male and the female during courtship believes that the male recognises the female and is excited by sexual instinct; at the same time he is afraid of her and hence his attitude of self-defence. The latest theory of Bristowe and Lockett² which is only a modification of Montgomery's views is stated thus—³'Since the male spider runs the risk of being killed and eaten by the female the first use of his courtship antics is to enable her to recognise him as a male and not to regard him as something to be eaten. When he has begun his courtship the male spider is practically safe but it takes a varying amount of continued

¹ T. H. Montgomery, 1910. *The American Naturalist*, vol. xlv.

² W. S. Bristowe and G. H. Lockett, *P.Z.S.* XXII, 2.

³ T. H. Savory, 1928. *The Biology of spiders.*

solicitations to stimulate the female so effectively that she submits herself to him. Recognition and stimulation are therefore both necessary before mating can take place.'

As Savory remarks¹ this later theory appears to be needlessly complex, attributing mental powers to the spider which it probably does not possess. Both the above-mentioned interpretations assume that the male is much better able to recognise the female than she is to recognise him.

The above study of 'courtship' in *M. plataleoides* shows that here at any rate a simpler interpretation is possible. *When 'courtship' begins the spiders do not appear to fully recognise each other but behave as if they are confronted by any stranger, 'recognition' taking place only as these movements have proceeded considerably, the finale of this attempt at recognition being reached when their forelegs have actually come into contact.*

¹ T. H. Savory, 1928. The Biology of spiders.